

Attorney's Docket: 2002DE313
Serial No.: 10/659,590
Group: 1621

REMARKS

The Office Action mailed March 25, 2004, has been carefully considered together with each of the references cited therein. The amendments and remarks presented herein are believed to be fully responsive to the Office Action. The amendments made herein are fully supported by the Application as originally filed. No new matter has been added. Accordingly, reconsideration of the present Application in view of the above amendments and following remarks is respectfully requested.

CLAIM STATUS

Claims 1-15 are pending in this Application, and by this Amendment, claim 1 has been amended.

Claim Rejection Under 35 USC § 103

Claims 1-15 stand rejected under 35 USC §103(a) as being unpatentable over Wolfram (US 4,647,709) in view of Nakayama et al. (US 4,289,916). This rejection is respectfully overcome.

Applicants' invention is directed to a method for the nuclear chlorination of ortho-xylene which includes reacting ortho-xylene with a chlorinating agent in the presence of at least one Friedel-Crafts catalyst and chlorine-substituted 2,8-dimethylphenoxathiin as a co-catalyst. Importantly, the ratio of 4-chloro to 3-chloro-1,2-dimethylbenzene is at least 3 to 1. Applicants have surprisingly and unexpectedly discovered that the present invention maximizes the yield of 4-chloro-1, 2-dimethylbenzene, which is the more economically valuable isomer.

Nakayama et al. discloses a process for selectively producing p-chloroalkylbenzene by chlorinating an alkylbenzene in the presence of phenoxthine and a Lewis acid or its precursor as a catalyst

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Wolfram teaches a process for ring-chlorinating toluene and specifically states in the abstract that "a particularly high proportion of p-chlorotoluene is obtained by in addition to the customary Lewis acid catalysts as cocatalyst a chlorination product of 2,8-dimethyl-phenoxathiin."

The Office is of the position that "one having ordinary skill in the art at the time the invention was made would have found it obvious to substitute xylene for toluene in the process taught by Wolfram. The skilled artisan would have a reasonable expectation of success, since Nakayama et al. teach a process which is similar to the process of Wolfram and which utilizes similar catalyst." Applicants respectfully disagree.

A sustainable case of obviousness requires the prior art to provide motivation to one with ordinary skill in the art to arrive at the claimed invention. Here such motivation is absent. Furthermore, the prior art does not present to the ordinary artisan a reasonable expectation of success that the modification advanced by the Office would yield a 3:1 ratio of 4-chloro- to 3-chloro-1,2-dimethylbenzene.

The chlorination of toluene in the presence of FeCl_3 usually leads to the formulation of o-toluene, wherein the ortho:para ratio is in the range of 65%: 35%. See Ullmann's Encyclopedia of Industrial Chemistry 5th edition, Vol. A6, page 343 (a copy of which is enclosed in the IDS filed herewith). The addition of the co-catalyst "chlorinated dimethylphenoxathiin" leads to the activation of the p-position, so that the ortho:para-ratio is then 40%: 60% (Wolfram US 4,647,709).

The chlorination of ortho-xylene in the presence of FeCl_3 yields 4-chloro-o-xylene: 3-chloro-p-xylene in a ratio of 60%: 40% (US 4,190,609).

One with ordinary skill in the art, having a knowledge of Wolfram and Nakayama would not be motivated to alter the Wolfram reference as suggested by the Office in order to derive a method to maximize the ratio of 4-chloro- 1,2-dimethylbenzene. The suggested teachings of the references, combined with that which is known by the artisan of ordinary skill would lead to the expectation

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the dimethylphenoxathiin, the less favored substitution position would be activated and therefore favor the formation of the 3-chloro-o-xylene. Consequently, one with ordinary skill in the art, having a knowledge of these references would derive no motivation there from to alter the process taught by Wolfram by substituting xylene for toluene as the references do not provide any teaching which suggests that this combination of co-catalyst and dimethylphenoxathiin advantageously leads to the formation of 4-chloro - 1,2-dimethylbenzene.

The Office's position of obviousness is also wanting as the mandated reasonable expectation of success is lacking in the proposed modification of the prior art. One with ordinary skill in the art, having a knowledge of Wolfram and Nakayama, would not enjoy any reasonable expectation of success that the claimed method maximizes the yield of 4-chloro- 1,2-dimethylbenzene rather than the 3-chloro 1,2-dimethylbenzene. Specifically, the prior art suggests that directly the opposite will transpire, namely the favoring of the 3-chloro- 1,2-dimethylbenzene to the disadvantage of the 4-chloro isomer. In fact, the combined teaching of the references, and that which is known by one with ordinary skill in the art, teach away from the instant invention, as all indications of the prior art suggest that the 3-chloro- 1,2-dimethylbenzene would be formed to the detriment of 4-chloro -1,2-dimethylbenzene.

As neither Wolfram nor Nakayama can provide one with ordinary skill in the art with the motivation necessary to achieve the present invention, it is courteously suggested that the Office is employing impermissible hindsight gained by a knowledge of Applicants' invention. Furthermore, the expectation of success, which is nowhere present in the prior art, is also seen to exist only in Applicants' disclosure. In consequence, Applicants contend that the claims as amended are not made obvious by any combination of Wolfram and Nakayama and courteously request reconsideration and withdrawal of the § 103 rejection.


As the total number of claims does not exceed the number of claims originally paid for, no fee is believed due. However if an additional fee is

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required, the Commissioner is hereby authorized to credit any overpayment or charge any fee deficiency to Deposit Account No. 03-2060.

In view of the forgoing amendments and remarks, the present application is believed to be in condition for allowance, and reconsideration of it is requested. If the Examiner disagrees, she is requested to contact the attorney for Applicants at the telephone number provided below.

Respectfully submitted,


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